REMARKS

New drawings are submitted. Claims 1 and 24 are amended to eliminate indefiniteness and have been amended to include a composition for the insulating coating. Original claim 5 and previously presented claim 22 described the composition of the insulating coating. No new matter has been added.

New claims 25-27 describe a thickness of the insulating coating, and depend from independent claims 1, 19 and 24, respectively. Basis for these claims can be found in US 6,380,114, see, e.g., col. 3, lines 44-46. US '114 issued from US patent application No. 09/719848, which was incorporated into the present application by reference. Claims 25-27 contain no new matter.

Pending claims include three independent claims and fifteen total claims. No additional fees are due.

Drawings

The Examiner objected to Figure 4 because it failed to show element "5" as described in the specification. Applicants submit a replacement sheet that corrects this oversight. Element "5" is described in the specification and is also shown in Figure 2. Applicants submit the amended drawing contains no new matter, and request admission of the amended sheet.

Section 112

The Examiner believes the phrases, "substantially covering the entire first outer surface" and "inner surface defining a bore" in claims 1 and 24 are new matter because they were not included in the originally filed application. The Examiner also believes "substantially covering" and "substantially the same" in claims 1 and 24 are indefinite.

Applicants have amended these phrases and believe the amended claims are not indefinite.

The Examiner argues the term, "thin slab," in claims 1, 4 and 24 is indefinite because it would not be understood by one of ordinary skill in the art. Applicants submit herewith an affidavit by Dr. Lawrence Heaslip, in which he avers "thin slab" nozzle is a term of art that is well known to one of ordinary skill in the art. The Examiner has also identified US 5,691,061 to Hasebe and US 5,673,857 to Meroni as teaching a "thin slab" nozzle. Applicants submit the term, "thin slab," is not indefinite.

Section 102 Rejections

The Examiner has rejected claims 1-4, 6 and 24 as anticipated by US 5,691,061 to Hanse and US 5,370,370 to Benson. Claims 1 and 24 are the only independent claims. Claims 2-4 and 6 depend from claim 1, and stand or fall with the independent claim. Anticipation exists where a single reference teaches, either expressly or inherently, each and every claimed element as interpreted by one of ordinary skill in the art.

Claims 1 and 24 have been amended to recite an insulating coating comprising a ceramic matrix and insulating microspheres. Hanse and Benson both teach a refractory article having a bore defined by a carbon-free liner, and show a nozzle having a slag-line sleeve covering a portion of the outer surface. Neither Hanse nor Benson teaches insulating microspheres in a ceramic matrix. Both lack at least one element of the pending claims, and so cannot anticipate claims 1-4, 6 or 24. Applicants request cancellation of this basis of rejection.

103 Rejections

The Examiner raises various objections based on Hanse and Benson in combination with WO 99/65842 to Brandy. Brandy corresponds to US 6380114 and issued from US Patent Application No. 09/719848, which was incorporated by reference in the present application.

A prima facie case of obviousness exists only when the Examiner provides:

1. one or more references;
2. that were available to the inventor;
3. that teach;
4. a suggestion to combine or modify the references;
5. the combination or modification of which would appear sufficient to have made the claimed invention obvious to one of ordinary skill in the art.

The Examiner combines Brandy with either Hanse or Benson, and argues the combinations obviate the present invention. Applicants disagree and argue the combination does not teach or suggest glazing over an insulating coating comprising a ceramic matrix and microspheres.

Claim 4

The Examiner has rejected claim 4 as obvious in light of US 5,691,061 to Hasebe and either Hanse or Benson. Hanse or Benson shows a nozzle having a slag-line sleeve. Hasebe describes a thin slab nozzle. The Examiner believes a slag-line sleeve is an insulating coating and combines Hanse or Benson with Hasebe to produce a thin slab nozzle having an insulating coating covered by a glaze.

Applicants submit herewith an affidavit by Paul Benson. The Benson affidavit explains that slag-line sleeves must consist essentially of compounds, which are resistant to slag corrosion and erosion. Claim 4 depends from amended claim 1 and is patentable as a dependent claim of an allowable claim. Claim 4 is also independently patentable

because the combination of cited references does not show all elements of the present invention. Claim 4 incorporates all limitations of claim 1.

Claim 1 describes the insulating coating as comprising at least 20 wt.% ceramic matrix and at least 5 wt.% insulating microspheres. Applicants submit that the combination of either (1) Hanse and Hasebe or (2) Benson and Hasebe would not produce a thin slab nozzle having a slag-line sleeve comprising a ceramic matrix and insulating microspheres.

The Benson affidavit states that a slag-line sleeve consisting of such an insulating coating is not resistant to slag, is friable at steel casting temperatures and, therefore, could not be used as a slag-line sleeve. The insulating coating of claim 1 has no practical use as a slag-line sleeve. The slag-line sleeves of Hanse and Benson cannot be considered an "insulating coating" within the meaning of amended claim 1.

A slag-line sleeve for the casting of molten metal cannot include an insulating coating comprising a ceramic matrix and insulating microspheres as taught in claim 1. One skilled in the art would not use the combinations suggested by the Examiner in the casting of molten metal. Applicants request cancellation of rejection and allowance of claim 4.

Claim 5

The Examiner has rejected claims 5 as obvious over Brandy in combination with either Hanse or Benson. Claim 5 depends from claim 1 and is patentable as a dependent claim of an allowable claim. Claim 5 is also independently patentable because the combination of the cited references does not show all elements of the present invention.

The Examiner argues one of ordinary skill in the art would have used the insulating coating composition of Brandy as shown in the slag-line sleeves of Hanse and Benson. The Benson affidavit explains that the composition claimed in Brandy cannot function as a slag-line sleeve. In fact, one of ordinary skill in the art would have avoided using the insulating composition as a slag-line sleeve because the casting life of the nozzle would be shorter with a slag-line sleeve consisting of the insulating coating than without the slag-line sleeve. Claim 5 is not obvious.

Claims 19-23

The Examiner has rejected claims 19-23 as unpatentable over Brandy in combination with any one of Hanse or Benson. Dependent claims 20-23 stand or fall with independent claim 19. The above arguments for the patentability of independent claims 1, 4, 5 and 24 are equally valid for claim 19.

The Examiner compares the slag-line sleeves of Hanse and Benson to the insulating coating of the present invention. The Benson affidavit explains that the insulating coating of amended claim 19 cannot function as a slag-line sleeve. Claim 19 is not obvious because one of ordinary skill in the art would never have used the insulating coating composition of claim 19 as a slag-line sleeve. Such composition would decrease rather than extend casting life of the nozzle. Claim 19 is not obvious where one skilled in the art would never have constructed the combination suggested by the Examiner.

New claims 25-27

Claims 25-27 depend from claims 1, 19 and 24, respectively, and are patentable as dependent claims of allowable claims. Claims 25-27 are also separately allowable because the insulating coating is limited to a thickness up to 7 mm. Slag-line sleeves

must have a thickness sufficient to delay erosion by slag. For example, Applicants interviewed the Examiner and presented her with a sectioned nozzle having a slag-line sleeve. The sleeve was approximately 20 mm thick.

The effectiveness of a slag-line sleeve depends on its composition and thickness. As explained above, the composition of the insulating coating, that is, microspheres in a ceramic matrix, would not produce an effective slag-line sleeve. Claims 25-27 limit the thickness of the insulating coating. This thickness provides sufficient insulation properties but is too thin to be an effective slag-line sleeve. A slag-line sleeve of only 7 mm would be impracticable because it would protect the nozzle for only a very limited time. Claims 25-27 are allowable.

In light of the above, Applicants respectfully submit that claims 1-6 and 19-27 are patentable over the prior art. Early and favorable action is earnestly solicited.

Date: 24 JAN 2006

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